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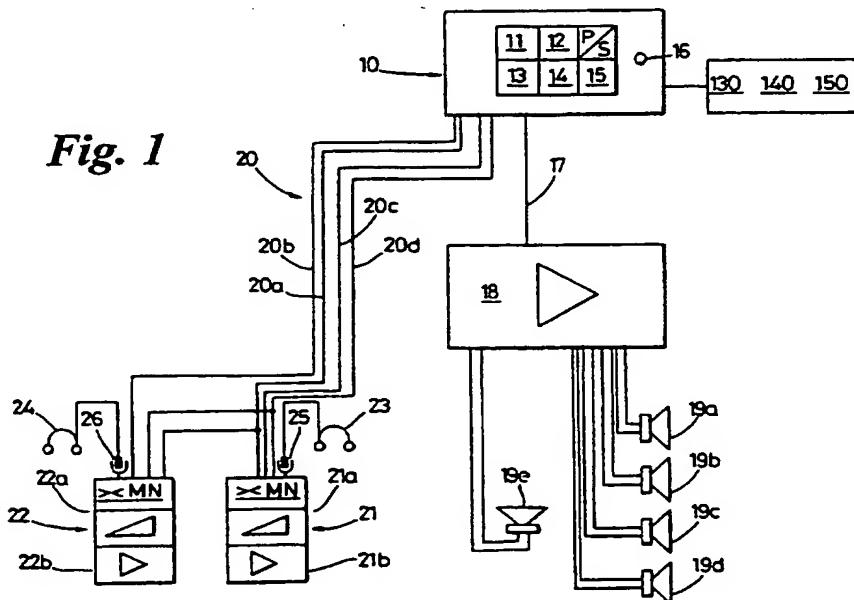
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## (54) An audio system for a vehicle

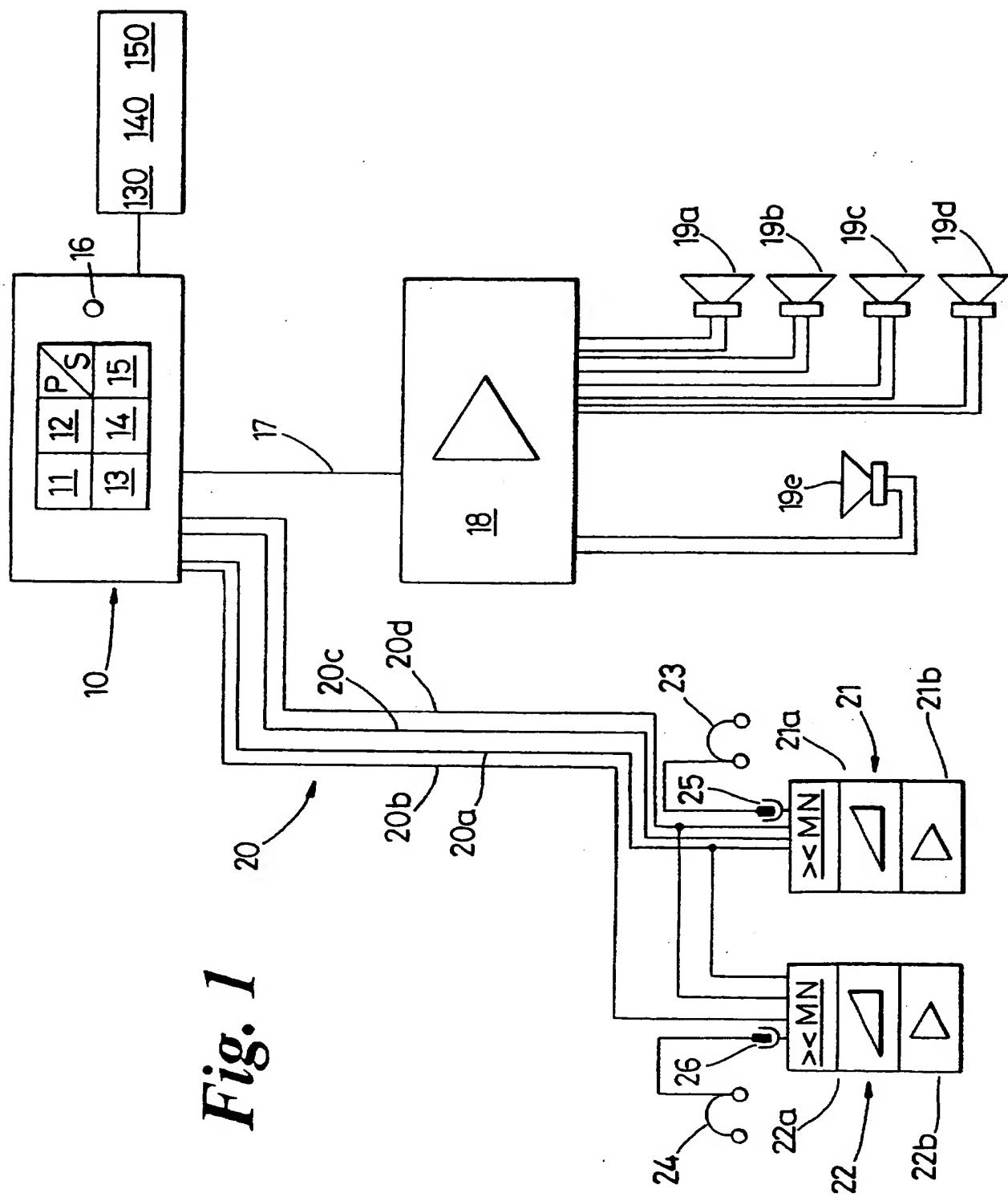
(57) An audio system for a vehicle is disclosed which comprises an audio unit 10 with two pre-amplifiers 11, 12 feeding primary and secondary audio outputs 17, 20. The pre-amplifiers can select between a plurality of audio sources 130, 140, 150 and the audio on one audio output line 17, 20 is selected and altered independently of the audio on the other output line 17, 20. The primary audio output line 17 feeds an audio amplifier 18 which supplies speakers 19a, 19b, 19c, 19d, 19e. The secondary audio output line 20 supplies headphone modules 21, 22 which provide independent audio for the rear seat passengers through sets of headphones 23, 24 under local selection and control of audio unit 10. The audio unit 10 alters the primary audio in response to the connection of either set of headphones 23, 24 to reduce mutual interference.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Mode	Keys					
	Vol +	Vol -	>	<	Mode	Next
Radio	Volume up	Volume down	Search up	Search down	Tape (or CD if tape not inserted)	Next preset
Cassette	Volume up	Volume down	Next track	Previous track	CD (or Radio if CD not available)	-
CD	Volume up	Volume down	Next track	Previous track	Radio	Next disc

Fig. 2

An Audio System For A Vehicle

This invention relates to audio systems and in particular to an audio system for a vehicle.

It is known to provide a vehicle with a system which can supply an audio output from more than one source. For example, it is common to 5 provide a choice between audio sources comprising radio, cassette or compact disc (CD) but the occupants are restricted to all listening to a single audio source at any one time.

It is an object of the present invention to provide an improved audio system.

10 According to the invention there is provided an audio system for a vehicle comprising an audio unit which can receive signals from two audio sources and which is arranged to provide, simultaneously from said audio sources, a primary audio output for a first speaker system and a secondary audio output for a second speaker system, a primary control means 15 arranged to control the audio unit to select the audio source for the first speaker system, and a secondary control means located remotely from the audio unit and arranged to control the audio unit to select the audio source for the second speaker system.

The selection of the audio source for one audio output may be made 20 independently of the selection of the audio source for the other audio output.

Each of the control means may alter the output of each audio source independently of the other control means.

The secondary control means may be arranged to control locally the secondary audio output and may include a local volume control for the secondary audio output.

The secondary control means may comprise a plurality of remote control 5 modules arranged to control the secondary audio source in parallel. The remote control modules may have common control over at least one function of the audio unit.

The secondary speaker system may comprise a set of headphones connectable to the or each remote control module.

10 The audio system may further comprise a sensing means forming part of the or each remote control module for sensing the connection of said headphones and may yet further comprise a sense line connecting a remote control module to the audio unit to indicate to said audio unit the connection of said headphones to the or each remote control module. The audio unit 15 may be arranged to make an alteration to the audio output of the first speaker system in response to a signal on said sense line.

Said alteration may comprise: switching off one of said first speakers; changing the frequency response of one of said first speakers; or a reduction of the sub-bass content of the audio output of a sub-bass speaker forming 20 part of the first speaker system. Said alteration may be manually selectable or de-selectable.

If the primary and secondary audio outputs are produced from the same audio source, the audio unit can control said audio source in response to

manual inputs on the audio unit and by remote control from a remote control module.

The invention also provides a vehicle having an audio system according to the invention.

5 The invention will now be described by way of example with reference to the accompanying drawings in which:

figure 1 is a schematic diagram of an audio system according to the invention; and

10 figure 2 is a table of some functions performed by one part of the system of figure 1.

Referring to figure 1, an audio system for a vehicle comprises an audio unit 10 which includes a first pre-amplifier 11, a second pre-amplifier 12, three audio sources: radio 130, cassette 140 and compact disc (CD) 150, a filter selector 16 and audio source indicators p, s.

15 The first pre-amplifier 11 is connected by a primary audio output line 17 to a primary audio amplifier 18 which supplies a stereo audio output to a pair of front speakers 19a, 19b, a pair of rear speakers 19c, 19d and a sub-bass drive unit known in the art as a sub-woofer 19e.

20 The selection of audio source 130, 140, 150 for the primary audio output line 17 is carried out at the audio unit 10 itself by manipulation of local manual selection buttons for radio 13, cassette 14 and CD 15.

The second pre-amplifier 12 is connected to a secondary audio output line 20 which comprises a parallel stereo line 20a, independent control lines 20b, 20c and a parallel sense line 20d.

The stereo line 20a, the control line 20c and the sensing line 20d are all 5 connected to an audio unit remote control module in the form of a first headphone module 21 positioned towards the rear and right hand side of the passenger compartment (not shown) in a place where it can be reached conveniently by a rear seat passenger.

A second headphone module 22 is on the left hand side of the rear 10 passenger compartment for use by another rear seat passenger. The second headphone module 22 is connected to the audio unit 10 by the stereo line 20a and the sense line 20d both in parallel with the first headphone module and by the control line 20b independently of the first headphone module 21.

The headphone modules 21, 22 each include a group of control keys 21a, 15 22a and an internal amplifier 21b, 22b and supply an audio output to their respective set of headphones 23, 24 through integral headphone sockets 25, 26. The headphone sockets 25, 26 include sensors (not shown separately) to detect the insertion of a headphone plug.

When the sensor in one of the sockets 25, 26 indicates that either set of 20 headphones 23, 24 has been connected to its respective headphone module 21, 22, the sense line 20d changes from a low state of 0V to a high state of 12V. The change of state of the sense line 20d is detected in the audio unit 10 and the stereo line 20a is enabled as a result.

The selection of audio source 130, 140, 150 for the secondary audio output line 20 is performed independently from the selection of audio source 130, 140, 150 for the primary audio output line 17 and is performed using the independent control lines 20b, 20c under the control of the control keys 5 21a, 22a in the headphone modules 21, 22.

Referring also to figure 2, the control keys 21a, 22a in each headphone module 21, 22 form a switched resistor network and provide the following functions, as defined in the table shown: volume up (Vol+), volume down (Vol-), forward (>), back (<), Mode Change (Mode) and Next. These 10 functions are used to select and alter the audio source 130, 140, 150 in the audio unit 10 for the headphones 23, 24.

The stereo line 20a provides balanced line audio signals in parallel to each headphone module 21, 22 in order to reduce interference on the cabling.

15 The signals to the headphone modules 21, 22 are at the same line level, and volume control for the headphones 23, 24 is carried out individually and independently in the respective headphone module 21, 22 under the control of the integral audio amplifier 21b, 22b and volume control function of the keys 21a, 22a.

20 Upon detection of a high state (12V) on the sense line 20d, the audio unit 10 alters features of the audio output fed to the speakers 19a to 19e.

The frequency response of the first pre-amplifier 11 is altered by a filter to reduce the bass content of the signal to the speakers 19a, 19b, 19c, 19d.

This reduces the interference from lower frequencies being heard by users of the headphones 23, 24.

The content of the sub-bass frequencies supplied to the sub-woofer 19e is also altered by the filter to reduce interference with the headphones 23, 5 24.

The rear speakers 19c, 19d are automatically turned down (or optionally turned off) so that they do not interfere with the headphones 23, 24.

The automatic alterations to the output of the first pre-amplifier 11 10 discussed above can be over-ridden by the driver. In particular, the filter is made selectable by the provision of the filter selector 16 on the audio unit 10.

The selection of audio source for the primary and secondary audio outputs 17, 20 is displayed on the source indicators p, s. If both audio 15 outputs 17, 20 are using the same source, then the source can be controlled from either the audio unit 10 by the user of the primary audio output line 17 or from either headphone module 21, 22 by the user of either set of headphones 23, 24.

Thus it can be seen that preferred embodiments of this invention can 20 provide an enhanced audio system for a vehicle in which it is possible to listen to either the same audio source with a choice of listening system, or to different audio sources selected and controlled independently, without the need to provide separate audio units.

CLAIMS

1. An audio system for a vehicle comprising an audio unit which can receive signals from two audio sources and which is arranged to provide, simultaneously from said audio sources, a primary audio output for a first speaker system and a secondary audio output for a second speaker system, a primary control means arranged to control the audio unit to select the audio source for the first speaker system, and a secondary control means located remotely from the audio unit and arranged to control the audio unit to select the audio source for the second speaker system.
2. An audio system according to Claim 1, wherein the selection of the audio source for one audio output can be made independently of the selection of the audio source for the other audio output.
3. An audio system according to Claim 1 or Claim 2, wherein each of the control means can alter the output of each audio source independently of the other control means.
4. An audio system according to any preceding claim, wherein the secondary control means is arranged to control locally the secondary audio output.
5. An audio system according to any preceding claim, wherein the secondary control means includes a local volume control for the secondary audio output.

6. An audio system according to any preceding claim, the secondary control means comprising a plurality of remote control modules arranged to control the secondary audio source in parallel.
7. An audio system according to claim 6, wherein the remote control modules have common control over at least one function of the audio unit.
8. An audio system according to any preceding claim, wherein the secondary speaker system comprises a set of headphones connectable to the or each remote control module.
9. An audio system according to Claim 8, further comprising a sensing means forming part of the or each remote control module for sensing the connection of said headphones.
10. An audio system according to Claim 9 further comprising a sense line connecting a remote control module to the audio unit to indicate to said audio unit the connection of said headphones to the or each remote control module.
11. An audio system according to Claim 10, wherein the audio unit is arranged to make an alteration to the audio output of the first speaker system in response to a signal on said sense line.
12. An audio system according to Claim 11, wherein said alteration comprises switching off one of said first speakers.

13. An audio system according to Claim 11, wherein said alteration comprises changing the frequency response of one of said first speakers.
14. An audio system according to Claim 11 wherein said alteration comprises a reduction of the sub-bass content of the audio output of a sub-bass speaker forming part of the first speaker system.
15. An audio system according to any one of Claims 11 to 14 wherein said alteration is manually selectable or de-selectable.
16. An audio system according to any preceding claim wherein, if the primary and secondary audio outputs are produced from the same audio source, the audio unit can control said audio source in response to manual inputs on the audio unit and by remote control from a remote control module.
17. An audio system substantially as described herein with reference to the accompanying drawings.
18. A vehicle having an audio system according to any preceding claim.



Application No: GB 9714748.2  
Claims searched: ALL

Examiner: Mr. Sat Sankurunath  
Date of search: 8 October 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): H4R: RSS, RST, RSX

Int CI (Ed.6): B60R, G08G, H04B, H04R

Other: Online: WPI, JAPIO, INSPEC

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X	EP 0414524 A2	BOSE - see especially figures 1, 2	1-3, 6, 7
E, X	US 5661811	DELCO - see especially figures 1, 2	1-5, 8, 16 and 18
A	US 5108335	AMERIMAX - see especially figures 1, 2	1
A	US 4435845	BLAUPUNKT - see especially figures 1, 4	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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